ALP-009-00

KAISER•HILL
COMPANY

RMRS Rocky Mountain Remediation Services, L.L.C.
...protecting the environment

Final East Trenches Plume Project Closeout Report Fiscal Year 1999

RF/RMRS-99-443.UN

February 2000

1/12

RF/RMRS-99-443.UN

FINAL

EAST TRENCHES PLUME PROJECT

CLOSEOUT REPORT
FISCAL YEAR 1999

Rocky Flats Environmental Technology Site

February 17, 2000

2

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1

2.0 PROJECT BACKGROUND 1

3.0 INSTALLATION OF THE SYSTEM 2

4.0 DEVIATIONS FROM THE DECISION DOCUMENT 3

5.0 REFERENCES 4

FIGURES

FIGURE 1. EAST TRENCHES PLUME SYSTEM LOCATION MAP 5

FIGURE 2. EAST TRENCHES PLUME COLLECTION TRENCH DETAILS 6

FIGURE 3. EAST TRENCHES PLUME TREATMENT SYSTEM ISOMETRIC 7

PHOTOGRAPHS

EAST TRENCHES PROJECT PHOTOGRAPHS 8

ACRONYM LIST

CDPHE	Colorado Department of Public Health and Environment
CWTF	Consolidated Water Treatment Facility
DOE	Department of Energy
EPA	Environmental Protection Agency
HDPE	High-Density Polyethylene
IHSS	Individual Hazardous Substance Site
pCi/g	Picocuries per gram
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RMRS	Rocky Mountain Remediation Services
µg/l	Micrograms per liter
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This report documents the completion of the East Trenches Plume Project at the Rocky Flats Environmental Technology Site (RFETS). This project was conducted in accordance with the Final Proposed Action Memorandum for the East Trenches Plume (RMRS 1999).

As a result of past waste storage practices at the East Trenches, volatile organic compounds are present in groundwater in excess of the Action Level Framework Tier I level groundwater concentrations defined in the Rocky Flats Cleanup Agreement (RFCA) (DOE 1996). The contaminated groundwater has migrated away from source areas towards South Walnut Creek.

As defined in the Proposed Action Memorandum (RMRS 1999), the objectives of this project were to:

- Intercept and treat volatile organic compound (VOC)-contaminated groundwater at the distal (northern) end of the East Trenches Plume.
- Protect surface water and reduce the VOC-contaminant mass loading in surface water, to the extent practicable.
- Install an easily accessible system to reduce operation and maintenance costs and to easily replace media when necessary.
- Minimize the impact to Preble's Meadow Jumping Mouse during construction.
- Avoid depletion of waters to South Walnut Creek.

2.0 PROJECT BACKGROUND

The plume of VOC-contaminated groundwater is derived from the East Trenches area which includes Trench T-3 (Individual Hazardous Substance Site [IHSS] 110) and T-4 (IHSS 111.1). These disposal trenches were used between 1964 and 1967 for disposal of sanitary sewage sludge contaminated with low levels of uranium and plutonium, VOCs and miscellaneous waste (DOE 1992). In 1996, these trenches were remediated as part of an accelerated source removal action (RMRS 1996).

A component of the plume is also believed to be derived from the VOC contamination at the 903 Pad and Lip Area where drums containing plutonium and uranium contaminated oils and solvents were stored from the summer of 1958 to January 1967 (RMRS 1997). A remedial action is planned to begin in 2001 to remediate the radiologically- and VOC-contaminated soils in this area.

Groundwater flow in the area is complex and is primarily controlled by bedrock surface features, interactions between geologic units, and variations in saturated thicknesses. The Arapahoe No. 1 Sandstone is present beneath the East Trenches source area and is the preferential pathway for contaminated groundwater to flow towards South Walnut Creek. The Arapahoe No. 1 Sandstone subcrops into the colluvium at a seep complex near South Walnut Creek. Much of the groundwater flow and contaminant flux for the East Trenches Plume is through the Arapahoe No. 1 Sandstone.

The primary contaminants in the East Trenches groundwater plume are VOCs derived from the Trench 3 and Trench 4 source areas. VOC contamination has been detected in the groundwater and in seeps at South Walnut Creek. In the source area, semi-volatiles, petroleum hydrocarbon compounds, and uranium-238 at concentrations up to 3,240 picocuries/gram (pCi/g) were also detected in the soils (RMRS 1996). At the collection system location, trichloroethene was the predominant contaminant found in groundwater with the highest concentration of 6,800 micrograms/liter (µg/l) in Well 23197. The other major contaminants included 1,1-trichloroethane at 730 µg/l in well 22697, and carbon tetrachloride at 460 µg/l in well 22997.

3.0 INSTALLATION OF THE SYSTEM

A groundwater collection and treatment system was installed to capture, redirect, and treat contaminated groundwater within treatment cells containing zero-valent iron. System installation began in February 1999 and was completed on September 23, 1999. The collection system was the last component completed. The system was partly operational after completion of the treatment system. At that time, the collected groundwater was routed through treatment cells containing zero-valent iron.

The groundwater collection system extends approximately 1,200 feet in an east-west direction (Figure 1) and captures the majority of the contaminated groundwater plume. To install the collection system, an excavation was dug at a variable depth of approximately 16 to 26 feet below ground surface, at least 6 inches, and on average, 3 feet into claystone. An impermeable barrier was installed that consists of 80-mil high-density polyethylene (HDPE) panels fitted with an interlocking strip on each side. A hydrophilic cord was threaded through the entire length of the interlock. This cord swells when wet, further sealing the panels together. These panels are 15 feet wide and of a variable height depending on the installation depth.

The bottom of the collection trench was filled with bentonite pellets to limit bypass or leakage. On the upgradient side of the barrier, approximately one foot of sand was placed over the bentonite to bed the collection line. The four-inch perforated HDPE groundwater collection line was placed on the sand, and piped to a central collection sump. Sand was then placed around and several feet above the horizontal collection line. The trench was then backfilled. Three piezometers were installed in the collection trench for monitoring of water levels within the collection system. Figure 2 shows the details of the trench construction.

A collection sump was installed at the eastern end of the collection system to accumulate groundwater, and to allow fine-grained sediment to drop out. The collected groundwater flows by gravity from the collection sump through a 2-inch, non-perforated HDPE conveyance line to the two treatment cells.

The treatment system consists of two high-density polyethylene tanks containing reactive iron, which degrades the dissolved VOCs in the groundwater. The system utilizes iron to induce conditions where hydrogen is substituted for chlorine in the chlorinated VOCs. The end products of the process are completely dehalogenated hydrocarbons and non-toxic salts. The treatment cells are approximately 12 feet in diameter and 13 feet tall. Groundwater enters the cells at the top and percolates through the 6.5 feet of iron. There is one foot of granular material on the bottom of each treatment cell to disperse the

groundwater. The upper foot of each cell is a 50/50 mixture of iron and pea gravel to simplify mechanical break-up of the expected crust formation.

The treatment cells are piped so that they can be run in serial or parallel (Figure 3). Water discharges from the base of the treatment cell to the next cell or to the metering manhole. The metering manhole contains a water-flow meter to determine the volume of water treated, and is the effluent sample location. From the metering manhole, the treated water then discharges to groundwater through an infiltration gallery located adjacent to South Walnut Creek. However, for additional flexibility, the system allows discharge directly to surface water in South Walnut Creek, if needed. Reclamation of the disturbed areas and restoration of the B-Series Pond road took place after installation of the collection and treatment system.

Four downgradient monitoring wells monitor the performance of the system. One existing well is being used along with three additional wells installed as part of the system (Figure 1).

4.0 DEVIATIONS FROM THE DECISION DOCUMENT

A minor modification was made to the design as presented in the East Trenches Plume Proposed Action Memorandum (RMRS 1999). In accordance with RFCA (DOE 1996), the minor modification was discussed with Environmental Protection Agency (EPA) and Colorado Department of Public Health and Environment (CDPHE). Verbal concurrence was obtained prior to implementing this change.

Because of operational constraints and above average precipitation during installation of the East Trenches Plume Project, a minor field modification to Section 5.2.5-Construction Waters (RMRS 1999), was made to allow construction waters at the East Trenches Plume Project to be discharged to the B-Series Ponds when large quantities of water generated during construction could not be effectively or safely collected and transferred to the Site's Consolidated Water Treatment Facility (CWTF). Water was primarily discharged to Pond B-2, however some water was also transferred to Pond B-1 to maintain a sufficient quantity of water in that Pond.

In addition, Figure 9 of the Proposed Action Memorandum (RMRS 1999) shows geotextile around the filter pack in the collection trench. The geotextile was removed when it was determined that it was not necessary.

Significant failure of the excavation occurred during installation of the collection system. This failure was due in part to well above average precipitation during installation of the collection system, which saturated and destabilized the excavation, and to a previously unidentified fault zone in the collection system area. Failure of the excavation resulted in damage and removal of several barrier panels. When continued installation of the collection system was not possible under existing conditions, a sand trench was installed along the planned location of the western half of the collection trench to drain the area. After the sand trench was completed, the barrier panels were installed starting at the western end of the collection trench. Solid steel plates were used to support the panels during installation instead of the previously used hollow frames. These solid plates were additionally braced by I-beams and, along with a modified trench box, limited excavation collapse.

Where the two portions of the collection trench met, it was not possible to interlock the panels due to the conditions. Therefore, a panel from the western leg of the collection trench was installed that overlaps the eastern leg of the collection trench by approximately 4 feet. The area between the two panels was filled with bentonite. The area behind the overlap in the panels was filled with bentonite to the top of the panels. In all, 5.5 supersacks of bentonite, each containing approximately 3,500 pounds, were utilized to seal the area where the two panels overlap.

The perforated collection pipe was broken in several places during installation. The pipe could not be repaired because the excavation could not be entered due to highly unstable conditions. A new section of pipe was placed adjacent to and overlapping the severed section, with both sections bedded in sand. Field observations during installation of the western leg of the collection trench indicated that this method worked very well for transporting the collected groundwater.

5.0 REFERENCES

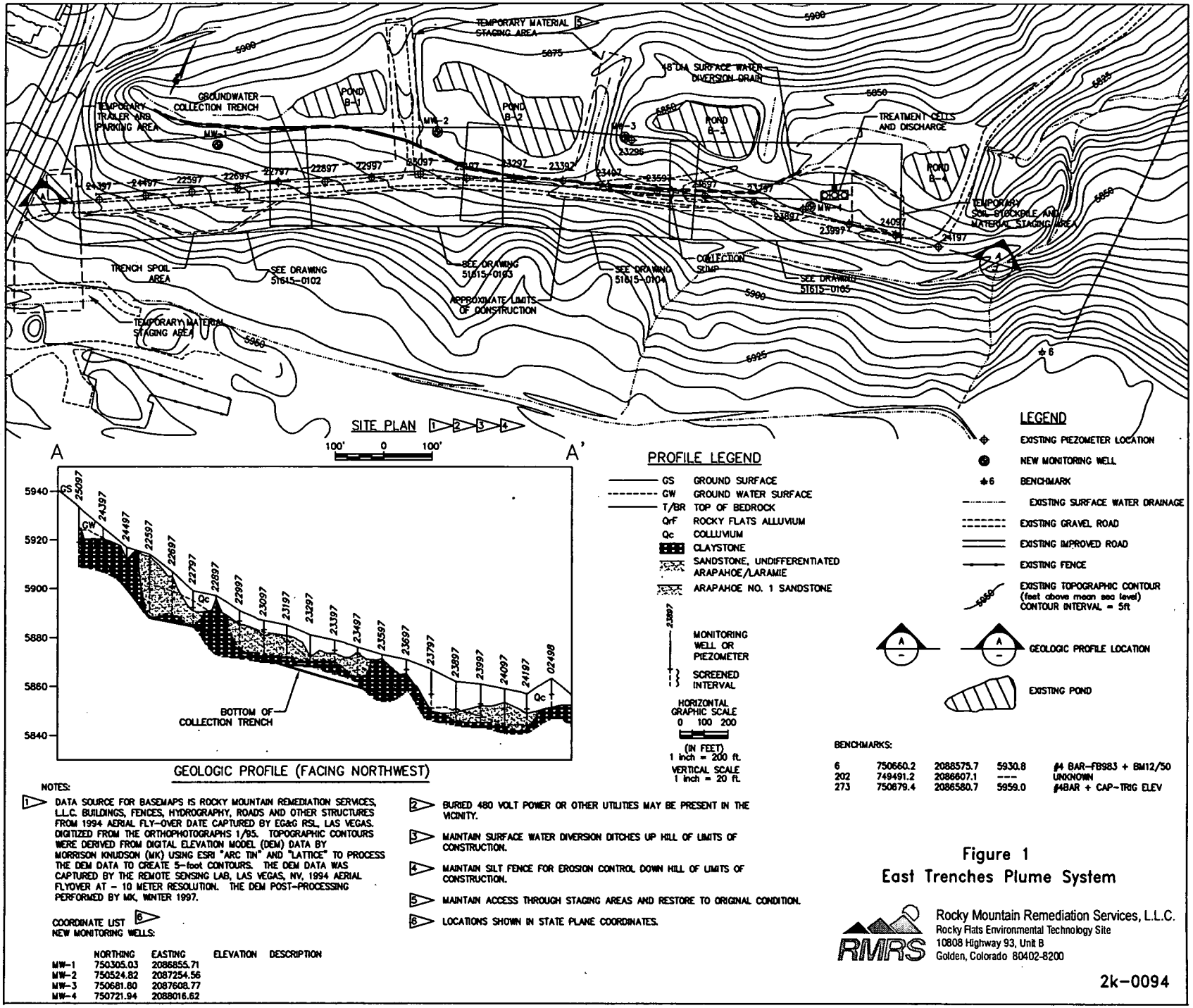
DOE, 1992, *Final Historical Release Report for the Rocky Flats Plant*, 21100-TR-12501.01, Rocky Flats Plant, Golden, CO, July.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Rocky Flats Environmental Technology Site, Golden, CO, July.

RMRS, 1996, *Completion Report for the Source Removal at Trenches T-3 and T-4 (IHSSs 110 and 111.1)*, RF/ER-96-0051, September.

RMRS, 1997, *Sampling and Analysis Plan for the Site Characterization of the 903 Drum Storage Area (IHSS 112), 903 Lip Area (IHSS 155), and Americium Zone,* RF/RMRS-97-084, January 1998 Rev.0.

RMRS, 1999, *Final Proposed Action Memorandum For The East Trenches Plume*, RF/RMRS-98-258.UN.



NOTES:

1. DATA SOURCE FOR BASEMAPS IS ROCKY MOUNTAIN REMEDIATION SERVICES, L.L.C. BUILDINGS, FENCES, HYDROGRAPHY, ROADS AND OTHER STRUCTURES FROM 1994 AERIAL FLY-OVER DATE CAPTURED BY EG&G RSL, LAS VEGAS. DIGITIZED FROM THE ORTHOPHOTOGRAPHS 1/95. TOPOGRAPHIC CONTOURS WERE DERIVED FROM DIGITAL ELEVATION MODEL (DEM) DATA BY MORRISON KNUDSON (MK) USING ESRI "ARC TIN" AND "LATTICE" TO PROCESS THE DEM DATA TO CREATE 5-foot CONTOURS. THE DEM DATA WAS CAPTURED BY THE REMOTE SENSING LAB, LAS VEGAS, NV, 1994 AERIAL FLYOVER AT ~ 10 METER RESOLUTION. THE DEM POST-PROCESSING PERFORMED BY MK, WINTER 1997.
2. BURIED 480 VOLT POWER OR OTHER UTILITIES MAY BE PRESENT IN THE VICINITY.
3. MAINTAIN SURFACE WATER DIVERSION DITCHES UP HILL OF LIMITS OF CONSTRUCTION.
4. MAINTAIN SILT FENCE FOR EROSION CONTROL DOWN HILL OF LIMITS OF CONSTRUCTION.
5. MAINTAIN ACCESS THROUGH STAGING AREAS AND RESTORE TO ORIGINAL CONDITION.
6. LOCATIONS SHOWN IN STATE PLANE COORDINATES.

COORDINATE LIST 6
NEW MONITORING WELLS:

	NORTHING	EASTING	ELEVATION	DESCRIPTION
MW-1	750305.03	2086855.71		
MW-2	750524.82	2087254.56		
MW-3	750681.80	2087608.77		
MW-4	750721.94	2088016.62		

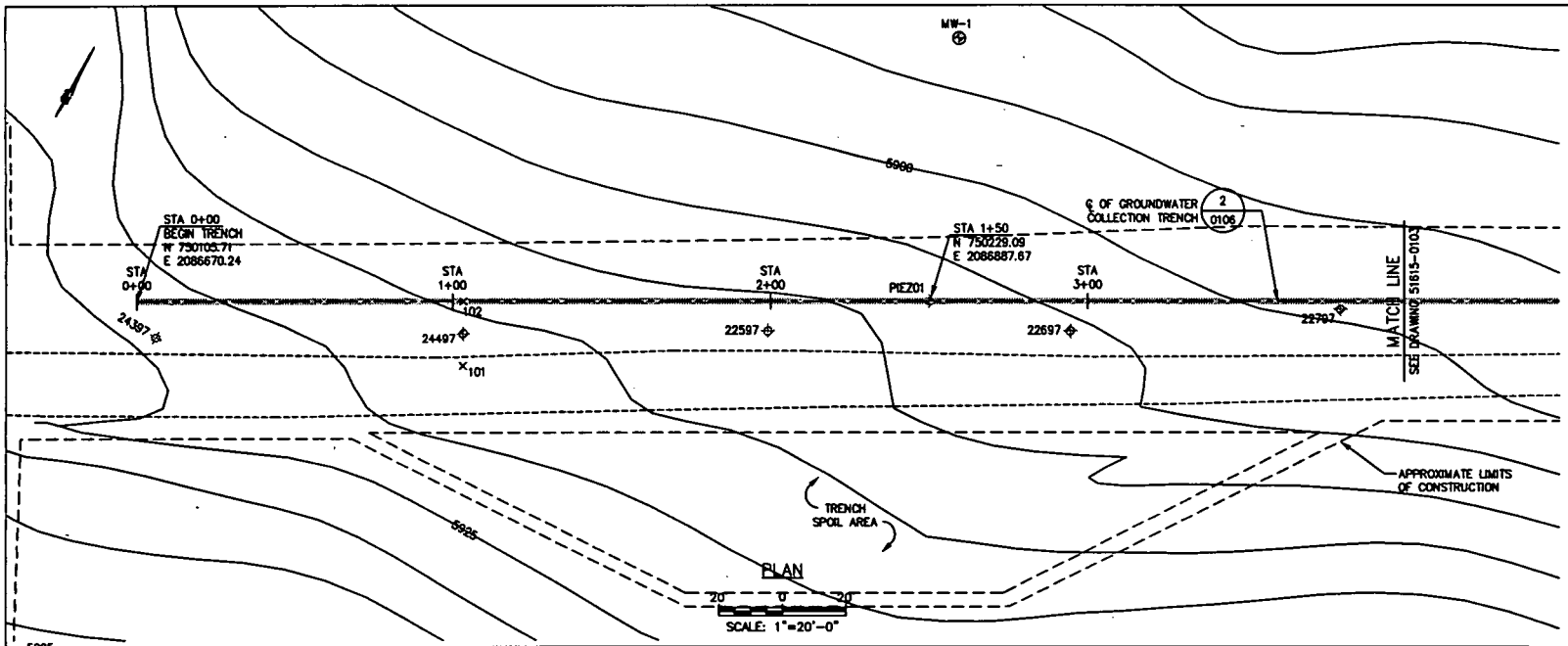
BENCHMARKS:

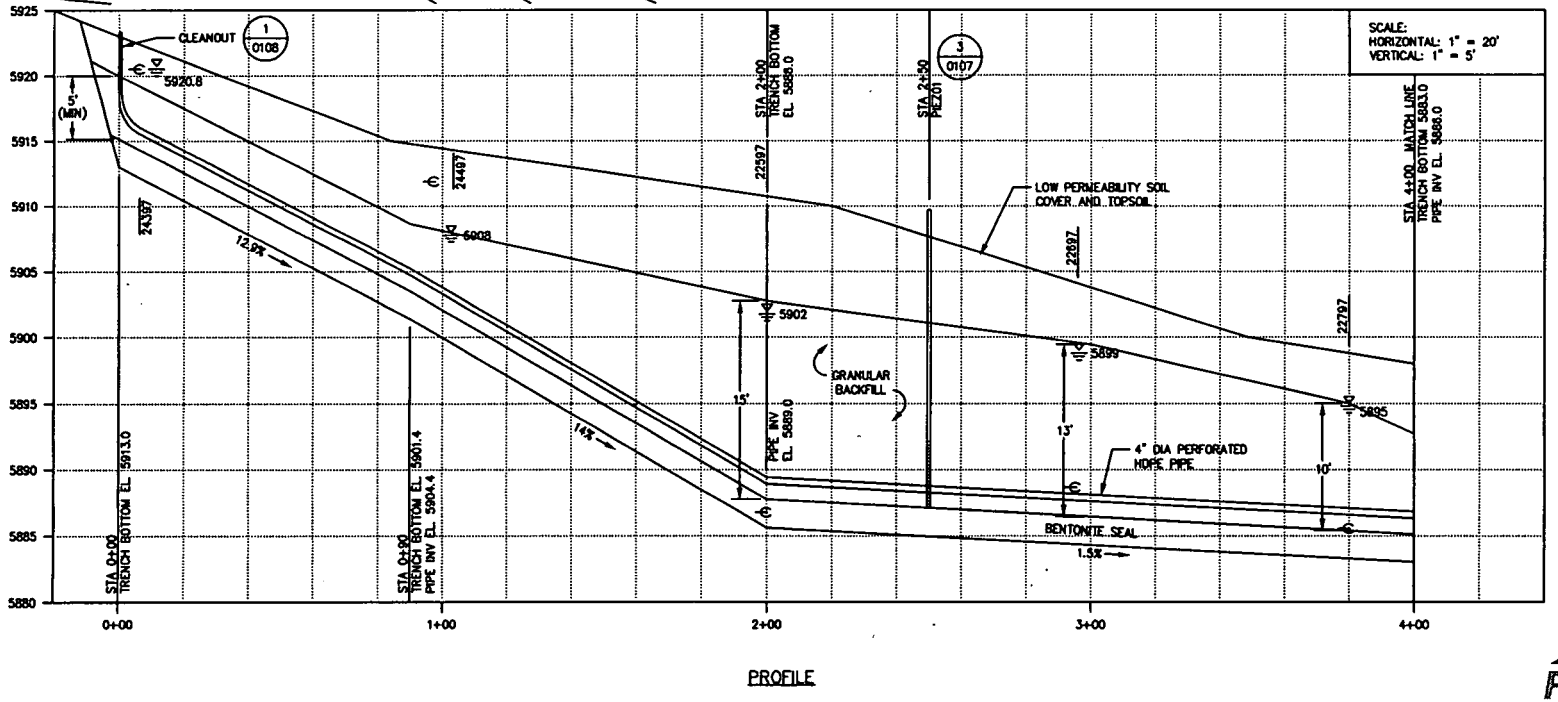
6	750660.2	2088575.7	5930.8	#4 BAR-FB983 + BM12/50
202	749491.2	2086607.1	---	UNKNOWN
273	750679.4	2086580.7	5959.0	#4BAR + CAP-TRIG ELEV

Figure 1
East Trenches Plume System

Rocky Mountain Remediation Services, L.L.C.
Rocky Flats Environmental Technology Site
10808 Highway 93, Unit B
Golden, Colorado 80402-8200

2k-0094





LEGEND

- NEW MONITORING WELL
- EXISTING PIEZOMETER
- NEW TRENCH PIEZOMETER
- TEMPORARY DESIGN REFERENCE POINTS
- EXISTING SURFACE WATER DRAINAGE
- EXISTING GRAVEL ROAD
- EXISTING IMPROVED ROAD
- EXISTING FENCE
- EXISTING TOPOGRAPHIC CONTOUR (feet above mean sea level) CONTOUR INTERVAL = 5ft
- TOP OF CLAYSTONE BEDROCK
- WATER TABLE ELEVATION (APRIL TO JUNE 1998)

SURVEY DATA [1] [2]

LOCATION	NORTHING	EASTING	GROUND SURFACE ELEVATION	DESCRIPTION
101	750139.3	2086769.9	5919.0	TEMPORARY DESIGN SURVEY POINTS
102	750156.7	2086760.1	5914.3	TEMPORARY DESIGN SURVEY POINTS

NOTE:
[1] LOCATIONS SHOWN IN STATE PLANE COORDINATES.
[2] EXISTING WOODEN STAKES USED FOR DESIGN; ESTABLISH SURVEY CONTROL DURING CONSTRUCTION FROM SITE BENCHMARKS.

Figure 2
East Trenches Plume
Collection Trench Details

Rocky Mountain Remediation Services, L.L.C.
Rocky Flats Environmental Technology Site
10808 Highway 93, Unit B
Golden, Colorado 80402-8200

2k-0094

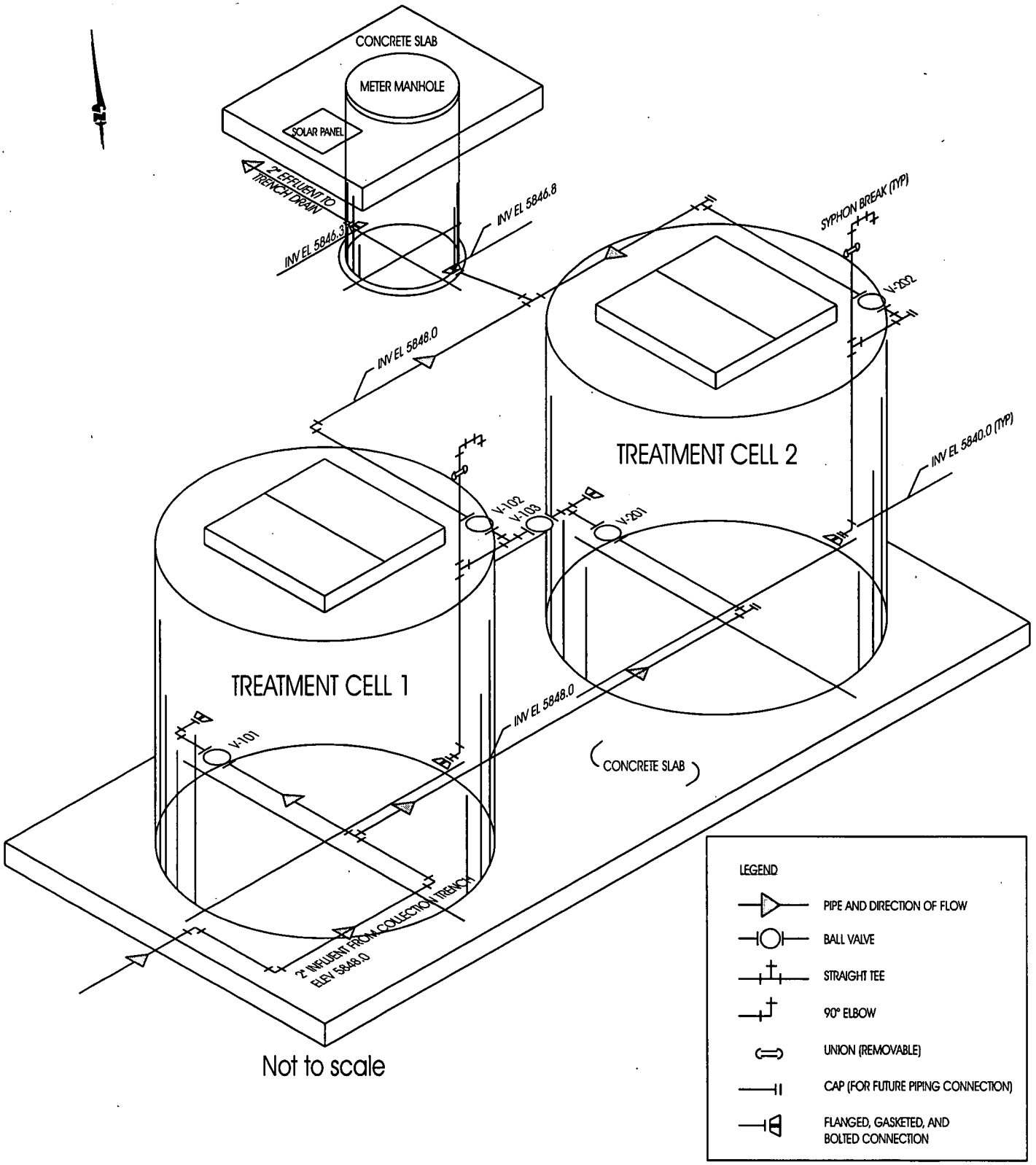
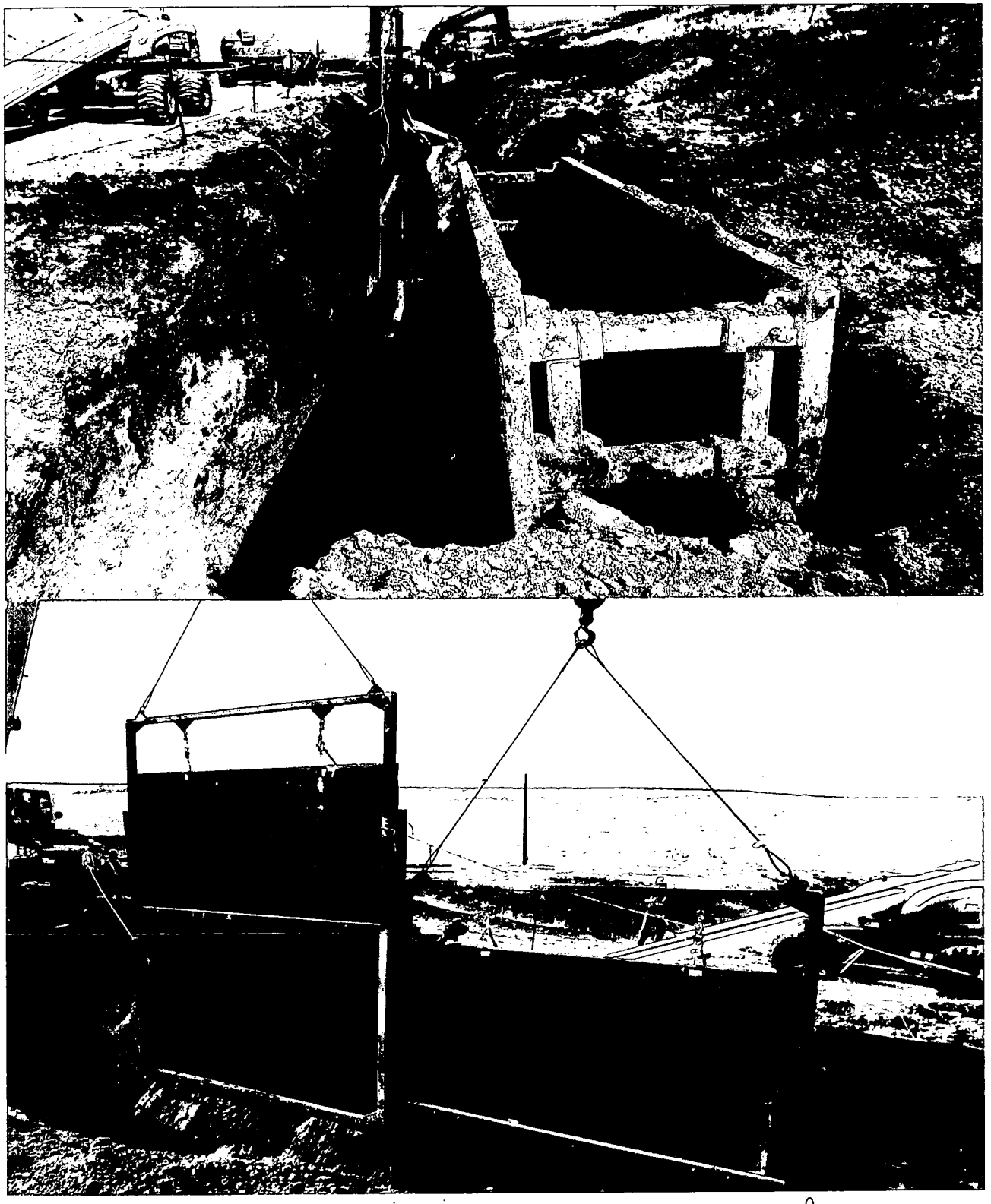


Figure 3 East trenches Plume Treatment System Isometric

RMRS
Rocky Mountain Remediation Services, L.L.C.
Rocky Flats Environmental Technology Site
10808 Highway 93, Unit B
Golden, Colorado 80402-8200

2k-0094



Installation of Panels at East Trenches

RMRS Rocky Mountain Remediation Services, L.L.C. ... protecting the environment

11

East Trenches Treatment Cells

RMRS Rocky Mountain Remediation Services, L.L.C.

. . . protecting the environment

12/12